

# Trust-based Task Allocation in Human-Robot Systems with two Actors

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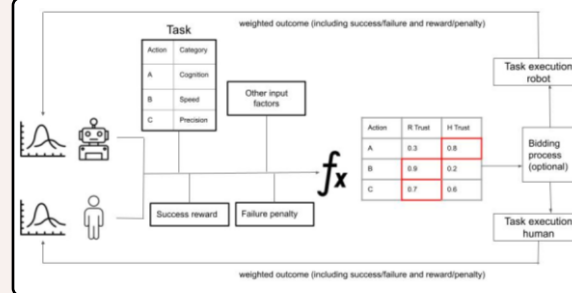
## Introduction

- How can we effectively allocate tasks based on trust in systems with two actors?
- Most research looks at models with multiple actors or only actors of one type.
- Existing models for two actors are very abstract and vague.
- Goal: Assign tasks so they are executed in the best way possible.

## Trust

- Trust in this model is bidirectional.
- Ideally appropriate trust is achieved.
- Undertrust and overtrust should be avoided.
- Main factors for calculating trust:
  - Current trust in actor
  - Reward for success
  - Failure for penalty
- Multiple other factors also have influence.
- Trust gets calculated more accurately over time.

## Basic Model



## Input Factors

- Most important input factors are:
  - Task history of each actor
  - Success reward
  - Failure penalty
  - Environmental factor
  - Confidence of human actor
  - Personality type
  - Time constraints
  - Workload
  - Personal preferences
  - Individual context
  - Social context
  - Risks and payoffs
  - Transparency
  - Principles and Ethics
  - Verifiability

## Formula for Trust

- $T_{\text{human}} = (T_{\text{int}} + T_{\text{ext}}) \cdot T_{\text{dep}}$
- $T_{\text{robot}} = T_{\text{ext}} \cdot T_{\text{dep}}$
- $T_{\text{int}}$ : Total internal trust, containing confidence, preferences, etc.
- $T_{\text{ext}}$ : Total external trust, containing Transparency, verifiability, etc.
- $T_{\text{dep}}$ : Dependent trust, contains factors like time constraints, environmental factor, etc. that are heavily dependent on the context and the actor.

## Possible Use-Cases

- Assembly lines and manufacturing
- Hospital robots
- Elderly assistance robots

## Future work

- Testing on real-world applications.
- Finding more accurate measurements for certain factors.
- Automatic determination of task granularity